

Microbial population in rotten living body of *Salix matsudana*

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Abstract The microbial population in rotten living body of *Salix matsudana* caused by *Trametes suaveolens* (L.) was researched. 11 bacteria species (1 species of *Bacillus*, 2 species of *Clostridium* and 8 species of non-brood-cell bacteria), 1 species of *Actinomyces* that belongs to Lavendulac, 8 species of fungi and 6 species of *Trichoderma* were isolated from rotten trunk. The hyphae of *Trametes suaveolens* mainly existed between rotten sections and discoloration sections. In over-rotten section and healthy section the fungi (*Trametes suaveolens*) were not isolated. The microbes that lived in the discoloration section were the most in kinds and number and they were the pioneer microbes of wood rotting. Only after they dwelled in wood and eliminated its rot-resistance, could wood-rotting fungi invade wood and caused wood-rotting.

Key words: *Trametes suaveolens*, Pioneer microbes, Microbial population, *Salix matsudana*

Introduction

So far, very few theoretical studies on wood-rot have been reported. During the past long time, the procedures of wood-rotting were divided into three stages: rot incipient stage, from hyphae intrusion to wood remarkable discoloration; rot middle stage, from wood discoloration to the evident change of wood topography; rot end stage, from the second stage to wood radical decomposition. According to this theory, wood discoloration was often regarded as wood-rot. Actually, wood discoloration is a common phenomenon, which can be caused by the intrusion of wood-rotting fungus and other reasons as well. It is a natural defense reaction of living body (Shao 1978). New researches reveal that no wood-rotting fungi occur when trees are hurt, because there are tannin, quinine, gelatin and packing materials. These materials are resistant to wood-rotting fungi. Only after some bacteria and fungi grew in the discoloration section, decomposed these tannin, quinine, gelatin and packing materials, and eliminated wood rot-resistance, could wood-rotting fungi invade and dwell in the wood. We call these bacteria and fungi as the pioneer microbes (Akai 1978). This paper reported the study on the microbial population in rotten living body of *Salix matsudana* caused by *Trametes suaveolens*.

Materials and methods

The experimental material was collected from *Salix matsudana* on the campus of Northeast Forestry University on April 1, 1996. Rotten trunk around the fructification is cut into 60 cm and taken into laboratory for use.

Three kinds of solid media were used: Broth Peptone Medium is used to isolate bacteria; Gao Number 1 medium is used to isolate actinomyces; PDA medium is used to isolate fungi.

The fructification and rotten trunks were cut along longitudinal direction. The samples were selected in different sections along transverse direction. The points included fructification, the barks near fructification, the barks near xylem, white rotten wood, brown lines, light-brown discoloration section, light-yellow discoloration section, rotten heart wood, light-brown discoloration section and healthy wood. 5 sample points around fructification in longitudinal direction were selected, including upper healthy wood, upper discoloration section, rotten heart-wood, lower discoloration section and lower healthy wood. 4 sample pieces (1 cm×0.5 cm) were cut at each point and put on the plates of Broth peptone medium, Gao Number 1 medium and PDA medium. They were incubated at the temperature of 25°C or 30°C in the thermostat. After 3-7days, the colonies grew around the wood pieces. The bacteria and actinomyces were isolated by scratching lines. The fungi were isolated by choosing mycelium from fungi colony.

The methods of the species identification are as follows: bacterium cultural character experiment

(Bacteria group of Microbe Research Institute of Science Academy of China 1987), Gram stain and brood-cell stain, observing the fungi under the microscope.

Results and discussion

11 species of bacteria, 1 species of actinomyces and 8 species of fungi are isolated from the samples of *S. matsudana*. One of 8 species of fungi is wood-rotten fungus. The sample isolation results are shown in Table 1. There are 4 species of microbes in the longitudinal upper discoloration section. The iso-

lating frequency is 9.6%. There are 5 species of microbes in the lower discoloration section. The isolating frequency is 10.80%. There are 4 species of microbes in the transverse discoloration section near healthy timber. The isolating frequency is 9.6%. There are no remarkable differences between transverse and longitudinal direction in the kinds and number of microbes. The wood-rotten fungus mainly exists between rotten section and discoloration section. It was not isolated from over-rotten section, discoloration section and healthy timber. There is no microbe in healthy timber.

Table 1. The results of sample isolation

Direction	Section	Microbe	Colony character	Colony number	Percentage (%)
On transverse direction	On fructification	Fungus A ₁	White, downy	2	3.6
	The barks near fructification	Bacterium H ₂	Milk white, dendritic	1	1.2
		Bacterium L ₂	Milk yellow, round, diameter (1.5-2.0 mm)	2	3.6
	The barks near xylem	Bacterium D ₂	White round, diameter (1.5-2.0 mm)	3	5.4
	White-rotten wood	Bacterium B ₂	Yellow, round, diameter (2.0-2.5 mm)	2	3.6
		Bacterium C ₂	Milk yellow, round, diameter (1.0-2.0 mm)	1	1.2
		Bacterium A ₂	Light yellow, round, diameter (3.0-3.5 mm)	2	3.6
	Brown lines	Fungus C ₁	Green, downy	3	5.4
		Bacterium D ₂	White, round, diameter (1.5-2.0 mm)	2	3.6
		Fungus A ₁	White downy	1	1.2
	Light-brown discoloration section	Fungus D ₁	White, flossy	2	3.6
		Bacterium E ₂	Milk white, round, diameter (1.0-2.0 mm)	3	5.4
	Light yellow discoloration section	Fungus D ₁	White, flossy	1	1.2
		Fungus B ₁	Light green, flossy	2	3.6
		Bacterium F ₂	Milk white, dendritic	2	3.6
		Bacterium H ₂	Milk white, dendritic	3	5.4
	Rotten heartwood	Fungus A ₁	White, downy	1	1.2
		Fungus E ₁	Light green, flossy	2	3.6
		Bacterium C ₂	Milk yellow, round, diameter (1.0-2.0 mm)	2	3.6
	Light brown discoloration section	Fungus F ₁	Green, flossy	2	3.6
		Bacterium D ₂	White, round, diameter (1.5-2.0 mm)	2	3.6
		Bacterium G ₂	Milk white, round, diameter (2.0-2.5 mm)	1	1.2
		Bacterium J ₂	White, round, diameter (2.0-2.5 mm)	1	1.2
	Healthy wood	No microbe			
On longitudinal direction	Upper healthy wood	No microbe			
	Upper discoloration section	Fungus H ₁	Dark green, flossy	1	1.2

Continued Table 1.

Direction	Section	Microbe	Colony character	Colony number	Percentage (%)
		Bacterium H ₂	Milk white, dendritic	2	3.6
		Bacterium D ₂	White, round, diameter (1.5-2.0 mm)	2	3.6
		Actinomyces I ₂	Spores light-violet gray, submerged mycelium white	1	1.2
	Rotten heartwood	Fungus A ₁	White, downy	1	1.2
		Fungus E ₁	Light green, flossy	2	3.6
		Bacterium C ₂	Milk yellow, round, diameter (1.0-2.0 mm)	2	3.6
	Lower discoloration section	Fungus G ₁	Green, downy	1	1.2
		Bacterium E ₂	Milk white, round, diameter (1.0-2.0 mm)	2	3.6
		Bacterium G ₂	Milk white, round, diameter (2.0-2.5 mm)	2	3.6
		Bacterium L ₂	Milk yellow, round, diameter (1.5-2.0 mm)	1	1.2
		Bacterium k ₂	White, round, diameter (2.2-2.5 mm)	1	1.2
	Lower healthy wood	No microbe			

D₂, F₂ and H₂ in the 11 species of bacteria have brood-cell. The brood-cell of D₂ is in the middle of the cell, not swelled, and belongs to the genus *Bacillus*. The brood-cells of F₂ and H₂ are on one end of the cells, not swelled, and belong to *Clostridium*. The other 8 species of bacteria have no brood-cells. One species of actinomyces belongs to *Lavendulac*. Among 8 species of fungi, A₁ is a pathogen-*Trametes suaveolens*, F₁ is one species of *Cytospora*, B₁, C₁, D₁, E₁ and G₁ belong to *Trichoderma*.

No wood-rotting fungi were isolated from discoloration section, but many bacteria and fungi were isolated. They are pioneers decomposing microbe of wood-rotting fungi. They change composition of wood reaction-belt so that the compositions can be used by wood-rotting fungi (Chinese Academy of

Forestry 1982).

References

- Akai, S.Y. 1978. Discoloration and decay of wood of living trees. *Forest Pests*, 2-9
- Bacteria group of Microbe Research Institute of Science Academy of China. 1987. General identification methods of bacteria. Beijing: Science Press
- Chinese Academy of Forestry. 1982. Forest diseases in China. Beijing: Forestry press of China
- Shao Liping. 1978. Study on the discoloration and decay of heartwood of larch artificial plantation. *Journal of North-east Forestry University*, (1): 107-113